DETAILED ACTION

Withdrawn Claim Rejections - 35 USC §§ 102 and 103

1. Applicants' amendment and arguments received 28 December 2007 have overcome each of the prior rejections, and they have all therefore been withdrawn.

New Grounds of Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 13-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Matero et al. U.S. 6,125,266 (of record) in view of Bradley et al. U.S. 6,262,637

Fig. 3 of Matero including the receiving portion shown in Fig. 3A and the transmitting portion shown in Fig. 3B, discloses circuitry comprising: an antenna 2G; a first duplexer 58 directly connected to the antenna, which inherently includes first and

second band pass filters by definition of a duplexer, wherein one filter passes the receiving frequency band and one filter passes the transmission frequency band; a second duplexer 60 directly connected to the antenna, which inherently includes third and fourth band pass filters as just described; a first signal path through the first duplexer 58, comprising a first transmission path and a first reception path; the first transmission path comprising: a first input terminal being the input of filter 48 which is connected to the other transmission elements (e.g. mixer 46, etc.), and a fifth band pass filter 48 between the first duplexer 58 and the first input terminal, and a first power amplifier 52 between the first duplexer 58 and the fifth band pass filter 48; the first reception path comprising: a first output terminal being the output of filter 7 which is connected to subsequent receiving elements (e.g. mixer 9, etc.), and sixth band pass filter 7 between the first duplexer 58 and the first output terminal, and a first low noise amplifier 5 between the first duplexer 58 and the sixth band pass filter 7; and a second signal path through the second duplexer 60, comprising a second transmission path and a second reception path; the second transmission path comprising: a second input terminal being the input to filter 50 connected to the other transmission elements (mixer 46, etc.), and a seventh band pass filter 50 connected between the second duplexer 60 and the second input terminal, and a second power amplifier 54 connected between the second duplexer 60 and the seventh band pass filter 50; the second reception path comprising: a second output terminal being the output of filter 8 connected to subsequent receiving elements (mixer 9, etc.), and an eighth band pass filter 8 connected between the second duplexer 60 and the second output terminal, and a

second low noise amplifier 6 connected between the second duplexer 60 and the eighth band pass filter 8. That is, Fig. 3 (3A and 3B) of Matero has a front-end circuit between the antenna and the TX/RX circuitry (i.e. starting at mixers 9 and 46) that has the same features as Applicants' Fig. 4.

However, Matero does not disclose the particular structure of its generic duplexers 58 and 60 being that shown in Applicants' Fig. 5 such that the first band pass filter of duplexer 58 and the third band pass filter of duplexer 60 are directly connected to the antenna and there are first and second quarter wavelength lines between the antenna and the second band pass filter of the first duplexer 58 and the fourth band pass filter of the second duplexer 60, respectively.

As shown by Figs. 1 4, 6 and 7 of Bradley such duplexers using thin film bulk acoustic wave resonators and having one filter directly connected to the antenna and a 90 degree phase shifter between the other filter and the antenna would have been extremely well known. Note that the phase shifter is a quarter wavelength transmission line (see col. 7, lines 5-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the front-end circuitry of Matero (Fig. 3), if even necessary, such that the generic duplexers 58 and 60 each would have included one band pass filter connected directly to the antenna and another band pass filter connected to the antenna by a quarter wavelength line such as that suggested by the exemplary teaching thereof by Bradley (ibid.), because Matero is silent as to the specific structure of its duplexers, thereby suggesting to one of ordinary skill in the art that any

well known duplexers, such as those of Bradley, would have been usable therewith, and such a modification would have been the mere substitution of art recognized alternative duplexers. Additionally, it should be noted that the structure of Applicants' Fig. 4 is known and disclosed by Matero, and the structure of Applicants' Fig. 5 is known and disclosed by Bradley, such that combining them would have been merely the combination of familiar elements according to known methods which is obvious because it would have yielded predictable results (see KSR [127 S Ct. at 1739]), since the use of the Bradley duplexer with the front-end circuit of Matero would not have altered the function or output of the Matero circuit.

4. Claims 1, 3, 5, 7-11 and 16-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Matero et al. U.S. 6,125,266 (of record) in view of Ella et al. U.S. 6,670,866 (of record).

Regarding claim 1, Fig. 3 (3A and 3B) of Matero discloses a circuit configured for use with mobile wireless systems with different frequency bands, the circuit comprising: an antenna connection 2G; a first signal path going through duplexer 58 electrically connected to the antenna connection and having a first 881MHz frequency band; a first output terminal being the output of filter 7 connected to secondary circuitry 9; and a first band pass filter being the receive filter of the duplexer 58 between the antenna connection and the first output terminal; and a second signal path going through duplexer 60 electrically connected to the antenna connection and in parallel with the first signal path, the second signal path having an assigned second frequency 1960MHz

band different from the first frequency band, the second signal path comprising: a second output terminal being the output of filter 8 connected to secondary circuitry 9; and a second band pass filter being the receiving filter of the duplexer 60 between the antenna connection and the second output terminal. Regarding claims 7-9, see the immediately preceding rejection. Regarding claim 16, the duplexers 58 and 60 are directly connected to the antenna 2G; the first transmission path through duplexer 58 comprises a first input terminal being the input of filter 48, and a first band pass filter 48 between the first input terminal and the first duplexer 58; the first reception path comprises a second band pass filter 7 between the first output terminal and the first duplexer 58; a second transmission path comprises a second input terminal being the input to filter 50, and a third band pass filter 50 between the second duplexer 60 and the second input terminal; and the second reception path comprises a fourth band pass filter 8 between the second duplexer 60 and the second output terminal.

However, Matero does not disclose the particulars of its duplexer including the receiving filters of the duplexers being thin film resonators and being directly connected to the antenna connection as required by claim 1, or a balun being in one of the first and second signal paths, or the filters including balun functionality such that at least one of the signal paths includes a symmetrical signal.

It should be noted that although only single lines are shown in Mateo Fig. 3, it would have been extremely well known that low noise amplifiers 5, 6 as well as mixers 9 often require symmetrical signals while the antenna connection is an unbalanced signal. One of ordinary skill in the art would have also known that symmetrical/balanced signals

in receivers also have inherent benefits such as being less susceptible to noise and higher receiver sensitivity. The Examiner Takes Official Notice that balanced operation of low noise amplifiers and mixers in a receive branch would have been well known and cites other art of record as evidence. Also, Applicants similarly do not specifically show two lines for symmetrical operation to their amplifiers in Fig. 4 as well.

Regarding claims 1, 10 and 16, Ella et al. discloses that it would have been well known to use thin film resonators in filters in duplexers, and discloses one embodiment of a duplexer (Fig. 18) that has a filter 10 that conducts a symmetrical signal in the receive branch, wherein the receiving filter 10 is directly connected to the antenna, the filter 10 has balun functionality and also qualifies as a balun in the signal path as required by claim 1. Regarding claim 3, the receive branches being the first and second filters directly connected to the antenna of claim 1, can also take the form shown of the filter and balun shown in Fig. 8 (see also Fig. 14, and col. 13, lines 18-20). That is, in each of the Rx and Tx paths of the duplexer in Ella can be a ladder or lattice filter with a balun 10 (see col. 11, lines 26-46) or the balun can act as the filter itself (see col. 13, lines 43-45). Regarding claims 5 and 11, the balun filter 10 is formed by stacking resonators (see Figs. 5 and 7 and col. 11, lines 43-46) that are acoustically coupled as indicated by the wavy lines in Fig. 5) to form a compound resonator.

Consequently, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the front-end circuit of Matero (Fig. 3) such that each of the generic duplexers 58 and 60 would have included a thin film resonator duplexer with a symmetrical signal and a filter with a balun or a filter itself with

balun functionality, such as suggested by the exemplary teaching thereof by Ella (see Figs. 18 and Fig. 8), with the receiving band pass filters being directly connected to the antenna, because Matero is silent as to the specific structure of its duplexers, thereby suggesting to one of ordinary skill in the art that any well known duplexers, such as those of Ella would have been usable therewith, and because such an obvious modification would have been merely the substitution of art recognized alternative duplexers wherein one of ordinary skill would have routinely chosen the proper duplexers with the proper terminals being balanced/symmetrical or unbalanced based upon the second stage circuitry connections or amplifier connections required, as would have been known by one of ordinary skill in the art. That is, although Matero only shows single lines for all of its connections, one of ordinary skill in the art would have known that it is standard for low noise amplifiers and mixers to function with balanced signals, as evidenced by other art of record, and the duplexers with balun functionality of Ella would have provided the additional benefit of miniaturization as explicitly suggested by Ella (see col. 2, lines 58-61) and as would have been known by one of ordinary skill in the art.

5. Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Matero et al. U.S. 6,125,266 in view of Ella et al. U.S. 6,670,866 (both of record) as applied to claim 1 above, and further in view of Tikka et al. U.S. 2003/0060170 (of record).

The Matero/Ella combination discloses the invention as discussed above, but does not specifically disclose the separation of the frequency bands being at least about 20dB.

Tikka et al. discloses that ladder filter typically provide selectivity of 25dB (see section [0004]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that in a Matera/Ella combination with ladder filter and balun structure shown in Ella Fig. 8 used in the receiving filter sections of the duplexers, to have modified the front-end filter duplexers, if even necessary, such that at least about 20dB of separation is provided between the filters, in view of the explicit suggestion by Tikka that the ladder filters already should have provided 25dB of separation (see section [0004]), and that more selectivity is better (ibid.).

Response to Arguments

6. Applicant's arguments with respect to the claims and the various rejections have been considered but are moot in view of the new ground(s) of rejection.

The Examiner will here respond to one argument that is considered pertinent to the new grounds of rejection.

Applicants argue that the "circuits described by Atarius and Matero work with unsymmetrical signals, and, thus, there is no reason for either to include a balun as required by claim 1" (see page 15, lines 7-9 of the response received 12/28/07). This argument is unpersuasive because it is not proper to conclude from the circuit drawing of Matero that it works with unsymmetrical signals, when even Applicants show only single signal lines in their Fig. 4 which clearly includes low noise amplifiers that are well known to function with symmetrical/balanced signals as evidenced by other art of record cited below and by Applicants' Fig. 3 duplexers that are to be used in their Fig. 4.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Takamine U.S. 6,873,227 provides evidence (see Fig. 14) that low noise amplifiers 165 and mixers 163, 166 would have been well known to function with symmetrical/balanced signals while power amplifiers 167 and the antenna operate with unbalanced signals.

Mang et al. U.S. 5,692,279 discloses a thin film filter with balun functionality (see Fig. 8) that is directly connected to an unbalanced antenna 82 (Fig. 9) as filter 83 to provide balanced signals to low noise amplifier 85.

Williams U.S. 3,868,608 provides evidence that amplifiers can be unbalanced or balanced and that thin film acoustic wave resonator filters with balun functionality are well known (see Fig. 1).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BARBARA SUMMONS whose telephone number is (571)272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Barbara Summons/
Primary Examiner, Art Unit 2817